REMARKS

This responds to the Office Action mailed on November 27, 2007.

Claims 23-25, 27-29, and 79-82 are under examination in this application.

The Rejections of the Claims Under §112

Claims 23-25, 27-29, and 79-82 were rejected on three different bases under §112—two asserted bases under §112, first paragraph, and one under §112, second paragraph. Applicants will address the first basis for rejection alone, and the second and third bases together.

Applicants note that the present application is a parent application and there are three pending divisional applications, each filed in response to restriction requirements in this parent application. The Examiner has entered similar, though not identical, §112 rejections in three of these pending applications. Responses have previously been filed in the two divisional applications addressing those rejections. As many of the issues pertinent to the rejections of the current claims under §112 have been addressed in one or both of those prior responses, Applicants will again present the arguments which are pertinent to the present claims to assure that the Examiner has had an express opportunity to consider those arguments relative to the present claims in advance of any appeal that may be necessary.

The First Rejection Under §112, First Paragraph

All claims, 23-25, 27-29, and 79-82 were rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement,[1] specifically for failing to disclose:

(a) "the minimum voltage and current to form a working nuclear voltaic cell (e.g. to generate a 1000 megawatt power);

[1] The statement of the rejection at paragraph 2 of the Office Action states the basis as "failing to comply with the enablement requirement;" but the statement proximate the six asserted deficiencies of the specification recites that there "is neither an adequate description nor an enabling disclosure" as to the identified six questions. See Office Action, paragraph 2, page 3 and page 4. Applicants assume that the only intended rejection is that on enablement and that the additional mention of the description requirement was unintended. However, Applicants submit that the reasons set forth herein establishing the impropriety of the enablement rejection are also equally pertinent to establishing the impropriety of the description rejection if such was intended.

(b) what level of purity is required for the liquid semiconductor (i.e. prior to introduction of chalcogen material);

(c) what are the temperature, flow and pressure levels of the system;

(d) what should be the volumetric or weight ratio of chalcogen to the liquid semiconductor;

(e) how and in what manner is it assured that nuclear decay products are sufficiently removed by a scrubber from the liquid semiconductor to minimize radiation damage (note that the ability to "self-heal" is an attribute of a liquid semiconductor that applicant alleges as a distinct advantage over solid semiconductors, and therefore minimizing radiation damage is critical to the invention);

(f) what is the required minimum enrichment for the chalcogen;"[2]

Applicants respectfully submit that the stated basis for rejection is based on an improper extrapolation from Applicants' specification, and upon improper conjecture based on that extrapolation. The Office Action misinterprets selected statements from the specification, taken in isolation, and then extrapolates from those misinterpreted statements to hypothesize that Applicants' invention requires a system with a power output equivalent to that of a nuclear power plant in the range of 1000 megawatts. Based upon that hypothetical power requirement, the Office Action then hypothesizes the above 6 questions not answered in the specification, resulting in the specification assertedly being non-enabling, and the claims thus not enabled.

Applicants first address the Office Action's improper premise that Applicants are describing a 1,000 megawatt nuclear voltaic cell, as this is a recurring and pivotal assertion in the rejections under §112. In support of this premise, the Office Action quotes numerous isolated passages from Applicant's specification. [3] In the interests of brevity, not all of those quoted passages will be repeated here. Even in all those quoted passages, however, the only specific power output identified by the Applicant is "power up to and exceeding the megawatt range."[4] But even that statement quoted in the Office Action cannot be used to support an allegation that

[2] See Office Action at pages 4-5.
[3] See Office Action, pages 3-4.
[4] See Office Action at page 3.

the claimed inventive nuclear voltaic cell is to have a capacity of even 1 megawatt. As stated by Applicants, (and including the second sentence omitted in the quote in the Office Action):

> The present invention is very adaptable because multiple nuclear voltaic cells -- comprising any of the embodiments described above, i.e., embodiments 1, 2, 3, or 4--may be linked together to form a critical array, described as embodiment 5 above, to provide power up to and exceeding the megawatt range. For small power needs a single or small number of cells may be used.

The invention claimed here is a single nuclear voltaic cell-- not a combination of nuclear voltaic cells as depicted in Fig. 9-- not a nuclear voltaic cell reactor, as depicted in Fig. 10-- not a nuclear voltaic cell reactor including a coolant loop and scrubber loop as depicted in Fig. 11. Just a single nuclear voltaic cell.

In being directed to a single nuclear voltaic cell, Applicants' claims correspond to the subject matter depicted in Figs. 1 and 4 of the specification. At the level of individual cells, the cells have the capacity to be relatively compact. As depicted in Fig. 1, a portion of the stacked structure in the depicted example embodiment is shown with a dimension of 1.63×10^{-2} cm. Thus, to any person skilled in the art, the described nuclear voltaic cell-- the device addressed in claims 23-25, 27-29, and 79-82-- is manifestly not one intended to power a "large transport vehicle" such as a submarine or ship; or to have an output in the range of 1,000 megawatts, as asserted in the Office Action. Such a power output from such a small cell would be quite remarkable; and certainly not expected by those skilled in the art.

Applicants are aware that the Examiner has substantial background in the nuclear arts; and if the examiner had not been so express about the allegation of a 1,000 megawatt nuclear voltaic cell,[5] Applicants would have had to assume that some different allegation was intended. However, given the express assertion, Applicants must respectfully submit that the conjecture as to the claimed cell is manifestly inconsistent with what would be understood by a person skilled in the art; and that the further extrapolation based upon that conjecture is simply inappropriate.

[5] See Office Action, page 4, last paragraph, item "(a)."

Additionally, the above-quoted passage of Applicants' specification discusses the linking of multiple cells together "to form a critical array . . . to provide power up to and exceeding the megawatt range."[6] Thus, even there, the specification speaks only of a power capacity exceeding a megawatt. For the Office Action to attempt to multiply that 1,000-fold, and convert Applicants' specification into one requiring enablement of a 1,000 megawatt power source, and to then interpret the specification as inadequate because it does not address questions which the Examiner conceives of relative to that 1,000 megawatt power source—from a single cell-- is inappropriate.

The Federal Circuit has instructed that the specification is presumed to be enabling:

> A specification disclosure which contains a teaching of the manner and process of making and using the invention in terms which correspond in scope to those used in describing and defining the subject matter sought to be patented *must* be taken as in compliance with the enabling requirement of the first paragraph of §112 *unless* there is reason to doubt the objective truth of the statements contained therein which must be relied upon for enabling support... [a]ny party making the assertion that a US patent specification or claims fails for one reason or another to comply with §112 bears the burden of persuasion in showing said lack of compliance.[7]

Thus, there is a clear presumption that a submitted specification is enabling, and the burden of persuasion is on a party seeking to establish non-enablement.

Importantly, precedent is clear that an applicant's burden to disclose only goes to that subject matter which is new. That subject matter which is conventional knowledge to those skilled in the art will be read into the disclosure:

> It is well settled that the disclosure of an application embraces not only what is specifically set forth in words or drawings, but what would be understood by persons skilled in the art. As was said in *Webster Loom Co. v. Higgins et al.*, 105 U.S. 580, 586 the applicant "may begin at the point where his invention begins, and describe what he has made that is new and where it replaces of the old. That which is common and well known is as if it were written out in the patent and delineated in the drawings.[8]

[6] *See* specification, page 12, lines 2-5.
[7] *Fiers v. Sagano, supra.*.
[8] *See In re Howarth*, 210 USPQ 2d 689, 691 (CCPA 1981)

Thus, subject matter which would be known to those skilled in the relevant arts is not required to be disclosed for the invention to be enabled.

Further, as is well known, the standard on enablement under §112 is that the claimed invention be sufficiently enabled that persons skilled in the art can make and use the invention without undue experimentation.[9] Thus, the stated test expressly contemplates that some selection and/or experimentation may be required. The fact that experimentation may be complex does not necessarily make it undue if the art typically engages in such experimentation.[10] It is also significant that when evaluating the question of enablement which may involve different scientific disciplines, that the specification is enabling if it enables those skilled in the art to carry out the different aspects of the inventions applicable to their specialty.[11]

Applicants respectfully submit that if the 6 questions raised in the Office Action were to be answered, they could only be answered by a specification that was, in fact, a blueprint for a specific nuclear voltaic cell—if even then. Some of the questions are so specific they could only be answered in response to a specific and fully engineered configuration. As but one example, as persons skilled in the art will recognize, the required level of purity for the liquid semiconductor is almost certainly, to at least some degree, subject to trade offs to other concerns (technical or commercial), and thus there is likely no single "correct" answer of the required level of purity, even as to a specific system configuration. At a bare minimum, the level of detail suggested to be required for enablement if each of the above 6 questions were in fact required to be answered, would be far in excess of that disclosed in the vast majority of U.S. applications and issued patents; and even further in excess of what is actually required by §112.

The requirement of providing information at a level of detail that would constitute a blueprint of the invention is clearly in excess of the obligation under 35 U.S.C. § 112, first paragraph. Accordingly, Applicants respectfully submit that the positions stated in this rejection

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[9] *See In re Wands* 8 USPQ 2d 1400, 1404 (Fed. Cir 1998); *see also United States v. Telectronics*, Inc., 8 USPQ 2d 1217, 1223 (Fed Cir 1988); (both as cited in MPEP §2164.01).
[10] *See* MPEP § 2164.01, and *In re Certain Limited-Charge Cell Culture Microcarriers*, 221 USPQ 1174 (Int'l Trade Comm'n 1983), as cited therein.
[11] MPEP §2164.05(b), citing *In re Naquin*, 158 USPQ 317, 319 (CCPA 1968).

fail to establish even a *prima facie* case of non-enablement in accordance with MPEP §2104.04, because it does meet the requirement of providing the required "reasonable basis" as to why the disclosure does not adequately teach the manner and process of making and using the invention.[12] Further, there is no substantive evidence or reasoning provided for why the answers to the 6 questions are assertedly necessary to have an enabling specification; and in the absence of such, there is no need for the Applicants to go to the trouble and expense of supporting the presumptively accurate disclosure.[13]

Additionally, Applicants respectfully submit that the detailed intricacies of the invention addressed by the above identified questions would be within the level of skill of those familiar and experienced in the design of nuclear power sources. As stated previously, specific answers to the questions will be dependent upon the precise configurations and materials selected for use. The persons having the ability to design a nuclear cell or battery will have the ability, in the course of such activity, to determine the answers to the above questions without undue experimentation. It seems apparent to those with an understanding of engineering that the design of nuclear power sources presents, under any circumstances, sophisticated engineering questions to be addressed. Applicants therefore feel that these points are sufficiently self-evident that no extrinsic evidence should be required to establish either the absence of a *prima facie* case of non-enablement, or the adequacy of Applicants' specification under §112. Accordingly, Applicants respectfully request the reconsideration and withdrawal of the rejections of claims 23-25, 27-29, and 79-82 under 35 U.S.C. § 112, first paragraph.

The Second and Third Rejections Under §112, First Paragraph And Second Paragraph

The second and third rejections under §112 are related to one another. All claims, 23-25, 27-29, and 79-82 were again rejected under 35 U.S.C. § 112, first paragraph, as based on a disclosure of which is non-enabling because the "scrubbing the liquid semiconductor of nuclear decay products is critical or essential to the practice of the invention, but not included in the

[12] *Stachelin v. Secher*, 24 USPQ 1513, 1516 (B.P.A.I. 1992) ("The law does not require a specification to be a blueprint in order to satisfy the requirement for enablement under 35 U.S.C. §112, first paragraph."
[13] *See* MPEP §2164.04; *In re Marzocchi*, 439 F2d 220, 224 (CCPA 1971).

claim(s) [sic] is not enabled by the disclosure."[14] Similarly, all claims were rejected under 35 USC §112, second paragraph, as being incomplete for omitting allegedly essential elements: "means for that scrubbing and purifying the liquid semiconductor."

The assertion in the Office Action is that Applicants allegedly admitted the criticality of scrubbing and purifying the liquid semiconductor, citing a sentence from paragraph 0014 of the specification. Paragraph 0014 (including the cited sentence), does not discuss at all liquid semiconductors, but describes problems with prior art solid semiconductors. Moreover, the passage does not discuss scrubbing or purifying the semiconductor. Instead the cited paragraph describes a disadvantage of prior art solid semiconductors--that over time trace amounts of defects, including native and impurity point defects significantly reduce semiconductor device performance. Overcoming these problems with solid semiconductors is one advantage of Applicants invention. Thus, in stark contrast to admitting the criticality of scrubbing and purifying the liquid semiconductor -- Applicants identified problems with prior art devices using solid semiconductors that were avoided with Applicants' invention.

With respect to the rejection under 35 U.S.C. § 112, second paragraph, the Office Action specifically refers to MPEP § 2172.01.[15] Applicants submit that the referenced section of the MPEP has been misinterpreted. This section starts by making clear that it relates to a situation where the applicant's specification has disclosed subject matter to be essential to the invention but that subject matter is not found that the claims: "[a] claim which omits matter disclosed to be essential to the invention as described in the specification or in other statements of record may be rejected under 35 U.S.C. § 112, first paragraph, as not enabling."[16] As noted above, this is simply not the fact situation presented here. Applicants have not made the supposed admission asserted in the Office Action. Accordingly, there is no basis for the entry of this rejection.

[14] See Office Action, paragraph 3, pages 5- 6
[15] Office Action, paragraph 4.
[16] MPEP, §2172.01. Applicants note that the section is specific that the rejection under the section, if it were appropriate, should be under §112, first paragraph, rather than second paragraph, as in the current Office Action.

Accordingly, for all the reasons set forth above, Applicants respectfully submit that each of the rejections under 35 USC §112 is inappropriate and should be withdrawn; and Applicants respectfully request such withdrawal.

Rejection of the Claims Under §103

Claims 23-25, 27-29, and 79-82 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mannik et al. (U.S. 5,859,484) in view of Greuter (J. Phys. C: Solid State Phys. 18 (1985)). Mannik is relied upon as teaching a nuclear battery formed from a crystalline semiconductor that incorporates a radioisotope such as tritium, and wherein the crystalline semiconductor material includes selenium. Greuter is relied upon to teach that selenium is a semiconductor "that has a crystalline structure when it is in a liquid state near its melting point."[17] The allegation in the office action is that it would have been obvious to one having ordinary skill in the art to modify the process of Mannik by providing selenium in a liquid state, "because such modification is no more than the use of a well-known expedient within the nuclear art."

Claim 23 is an independent claim, from which all other claims depend, directly or indirectly. Claim 23 defines a nuclear voltaic cell having a radioactive isotope in solution in a liquid semiconductor. Claim 23 further recites that the cell includes first and second metal contact layers that are in contact with the liquid semiconductor, with one metal contact layer forming a Schottky contact with the liquid semiconductor and the other metal contact layer forming a low resistance contact with the liquid semiconductor.

As with prior rejections that have been entered in this application and subsequently withdrawn, this rejection merely asserts, without justification, that it is obvious to take a structure expressly disclosed as utilizing a solid semiconductor, and to replace that solid semiconductor with any liquid semiconductor. The device of Mannik, using a solid semiconductor is subject to the same problems as discussed in the Background of Applicants' specification (and as referenced earlier in this response) of damage in the solid semiconductor

[17] See Office Action, pages 6-- 7.

lattice caused by the radiation.[18] This concern is expressly acknowledged by Mannik at column 4, lines 31-35 where the reference states "[f]or certain applications, it is preferable to use a radioisotope that emits only low energy particles, to minimize degradation of the semiconductor material and to maximize battery lifetime."

Most importantly, Mannik describes the semiconductor materials used with the invention in a manner inconsistent that expressly teaches away from any possible use of liquid semiconductors—as non-homogeneous structures:

> The preferred structures of the semiconductor *of the present invention* are p-n homo- or heterojunctions or quantum well structures. Preferably, the semiconductor is a heterostructure. With such structures, doping using magnesium, selenium and tellurium can be used to control carrier diffusion in the semiconductor material.[19]

This control of carrier diffusion within the semiconductor, through use of various "containment" structures or mechanisms in the liquid semiconductor, is the primary point of the Mannik disclosure.[20] The described heterojunctions and heterostructures are inconsistent with any liquid semiconductor, which is unable to retain any distinct structural regions, doping profiles or gradations. This is further addressed by Mannik at column 4, line 48--column 5, line 22. Thus, replacing the solid semiconductor of Mannik with a liquid semiconductor would require ignoring the primary teachings of the reference--which there is no motivation to do. Greuter provides no teaching of pertinence other than that selenium can be a liquid semiconductor.

The only suggestion to replace the solid semiconductor on Mannik with a liquid semiconductor is that which comes from reading Applicants' specification, and seeking to reconstruct it through impermissible hindsight. Applicants respectfully submit that once again, Applicants have demonstrated that the applied prior art does not provide any teaching that would motivate a person skilled in the art to achieve the invention claimed by Applicants; and Applicants respectfully request the reconsideration and withdrawal of the rejection of claims 23-25, 27-29, and 79-82 under §103.

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[18] See Applicants specification at page 4
[19] Mannik, Col 4, lines 42-45 (emphasis added).
[20] See Mannik, Cols. 3-4.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. If there are any matters that may be resolved or clarified to telephone interview, the Examiner is respectfully requested to contact Applicants' undersigned attorney at (512) 628-9324.

If necessary, please charge any additional fees or credit any overpayments to Deposit Account No. 19-0743.

Respectfully submitted,

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